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SOME ASPECTS OF BOVINE STERILITY*

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Since this paper is merely complementary to a demonstration it must of necessity be brief. Consequently, it will not be possible to go into detail, especially in regard to examination and treatment, both of which will be discussed at some length during the demonstration. Nevertheless, it should be stressed (and the sooner and the more emphatically the better) that a complete examination of the female animal must be carried out before any drastic treatment is undertaken, otherwise disastrous results in the form of abortion of a foetus or even death of the mother are likely to result. It must be remembered that some cows will continue to come into oestrus even when in calf and have even been known to calve a few hours after being bulled.

It is, in the essayist's opinion, much easier to make a correct diagnosis of the actual trouble in the genital tract by a careful rectal examination, than it is to diagnose the particular nature of abnormalities in the chest by auscultation. In the former case there is something definite about the ability to handle the reproductive organs.

To start with, it is advisable to obtain as complete a history of the case as possible. When dealing with a cow or heifer one should ascertain the date of the last calving—was it at full time? Did the animal cleanse properly? How many times has she been served, and when was the last time? When was she in service last, and what was the duration of oestrus? Does she come into service regularly? Has she been blood-tested and with what results, etc., etc.?

There have been a number of classifications of bovine sterility—the commonest probably being that in which this trouble is divided into temporary and permanent infertility. One which has much to recommend it is that recently used by Murray in which he divides his cases into infectious and non-infectious. At the present time this system of classification is extremely helpful in that it enables one to obtain a clear perspective of the relative importance of the different causes of sterility.

Infectious sterility is due to virus, bacterium or protozoon, and it must be borne in mind that no matter where organisms settle down in the female genitalia, not only are the resulting gross changes responsible for infertility, but the earlier inflammatory exudate has a deleterious effect on spermatozoa which are attracted by leucocytes and become agglutinated. It also brings about spermatolysis and interferes with implantation of the ovum.

Starting with the cow, it is best to consider separately the various regions of the genital tract.

THE VAGINA.—The majority of cases of vaginitis are secondary to infection higher in the genitalia with or without a discharge flowing over the vaginal floor; generally the trouble is secondary to a metritis. This applies particularly to those cases which fail to respond to local treatment, and many of these clear up spontaneously when the primary seat of infection has been successfully treated. In vaginitis of this type, part or whole of the vaginal mucosa assumes a roughened nature and a dirty pinkish yellow appearance, the lymph nodules in the affected area being noticeably enlarged, and so typical is this picture that in many cases one could almost diagnose endometritis by an examination of the vagina alone. Strangely enough the superior and inferior fornices frequently remain normal, but before more can be said about this form of vaginitis one must await further information from our anatomists regarding lymph flow in female genitalia. Various forms of primary vaginitis do occur and these include vesicular vaginitis (or "bull burn"), which is probably due to a virus; granular vaginitis, of which the cause is unknown, and which is found in several parts of the country (although many cases so diagnosed are secondary in origin), and early trichomoniasis, the vaginitis occurring immediately after the introduction of the organisms into the vagina by copulation. Primary vaginitis may also result from lack of adequate precaution when inserting the hand or instruments into the vagina, or from infection of vaginal wounds caused at the time of calving. In this respect the extent of cervical and vaginal damage which does occur in cows and particularly in heifers which are presumed to have calved normally, is astounding.

As regards treatment, if one is dealing with a secondary vaginitis, ignore the vagina and go straight for the primary seat of infection. In cases of primary vaginitis local treatment can be adopted and one can recommend weekly irrigation with 1 : 1000

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aqueous iodine solution, 1 per cent. zinc sulphocarbolate, or salt and water (one handful of salt to two gallons of water). It is important to avoid setting up further inflammation by the use of highly concentrated solutions or other irritants. Entozon pessaries or protargol sticks may be used. It would often appear that a change from one antiseptic solution to another will bring about a spectacular improvement. An old-fashioned but nevertheless effective remedy is the introduction of a handful of salt into the vagina. In cases of vaginitis due to trichomoniasis, lactic acid in 3 per cent. solution can be used for syringing the vagina. In most of such cases, however, the parasites will have spread rapidly forward.

Non-infectious forms of sterility can be due to abnormalities such as cysts, persistent hymen, large and ballooned vagina, etc. (The development of the genitalia is adversely affected in heifers kept in poor condition.) Cysts and persistent hymen (or white-heifer disease) can be treated surgically; although in white-heifer disease the prognosis is very unfavourable, other anatomical abnormalities can sometimes be overcome by artificial insemination.

The Cervix.—Cervicitis is frequently secondary to endometritis or vaginitis, much more frequently the former. It also occurs as the result of infection superimposed on injury occurring at parturition.

In acute cases there is great enlargement of the cervix; folds of cervical mucosa extrude from the *os* and are readily seen on examination with a speculum and an electric torch. When the acute symptoms have subsided a certain amount of fibrosis is liable to occur and to interfere with conception. In the treatment of acute cases great care must be taken. Resort to as little interference as possible, and above all, do not fix the cervix with vulsella forceps. Using a speculum, the visible cervix can be painted with a weak iodine solution. Only when the acute phase has passed (and not before) should an attempt be made to clear up any accompanying endometritis. Any antiseptic used for this purpose will flow back through the cervical canal and exert a beneficial local effect.

The Uterus.—In the bovine uterus, the body is so small that it is of little importance compared with the horns. Infection can lead to an acute metritis, a simple endometritis, a catarrhal endometritis or to a pyometra.

In the first fortnight after calving, the acute metritis or septic womb is well known to us all, often following retention of the foetal membranes, and it may lead to either the death of the cow or one of the other three types of metritis, although, of course, any one of these can arise independently. In simple endometritis there is little to discover on rectal examination, but there may be some thickening of the uterine wall which will probably feel spongy, and a little pus may be massaged through the cervix, while oestrus may be either regular or irregular.

Cases of catarrhal endometritis are characterised by varying degrees of enlargement of the uterine horns, and a vaginal discharge which varies in nature, and the animal may or may not come into service. Pyometra is accompanied by a distention of one or both horns, which on rectal examination may be confused with pregnancy, although there is usually less fluctuation in a case of pregnancy, but in some instances one or both horns are so distended with pus that they fall forward over the pelvic brim and are scarcely palpable. Both catarrhal endometritis and pyometra are frequently complicated by salpingitis.

By far the greater number of cases of simple and catarrhal endometritis are secondary to brucellosis, which disease appears to lead to a predisposition to subsequent infection, while most cases of pyometra and some of catarrhal endometritis are due to trichomoniasis or corynebacterial infection, the former condition being often associated with abortions during the first four months of pregnancy, and the latter with abortions between the fourth and sixth months.

All cases of endometritis and pyometra not complicated by bilateral salpingitis should be treated as early as possible, and uterine irrigation usually gives the best results. Whenever pus is present in the uterus any corpus luteum present in an ovary should be expressed.

A better method of dealing with pyometra may be evolved from experimental work now in progress. The intention is to enhance the effect of pituitrin by sensitising the uterus a few days previously with oestradiol or the synthetic compound triphenyl-chloro-ethylene. Possibly also the uterus should be incriminated in a condition sometimes met with, in which the cow is got into calf and normal progress is maintained for about two to four months, when the foetus is gradually absorbed. More work must be carried out to ascertain the cause of this trouble. The clinical picture suggests a vitamin E deficiency, since similar results are obtained by keeping rats on a vitamin E deficient diet. In herds where this type of sterility is common wheat germ oil can be given during the first four months of pregnancy.

The Fallopian Tubes.—Inflammation of the Fallopian tubes, or salpingitis, is usually secondary to pyometra or catarrhal endometritis. Occasionally one encounters cases of tuberculous salpingitis in which infection has spread from a tuberculous peritonitis, nodules being found along the course of the Fallopian tube, but fortunately this type of the disease is becoming increasingly rare.

Inflammation of the oviduct leads to thickening which can readily be detected on rectal examination, and at the same time adhesions are contracted in the ovarian bursa so that only one finger instead of two or three can be introduced. This condition is frequently met with in association with brucellosis. Further, adhesions tend to anchor the ovary, and finally the lumen of the tube probably becomes obliterated.

Salpingitis to any degree is serious and when bilateral the case is hopeless. Efforts to open up the tubes again by means of air pressure, as has been done in women and mares, have not proved successful in bovines.

The Ovaries.—Rarely are the ovaries the seat of infectious sterility, but sterility of ovarian origin may be caused by cysts which in some instances appear to be secondary to endometritis.

Non-infectious sterility apart from anatomical abnormalities (including freemartinism) is almost always due to ovarian trouble. The profession has heard much (too much in fact) about ovarian derangement during these last two or three years, and such fascinating accounts of hormone upset have been given by experimental physiologists that quite a large number of veterinarians are of the opinion that a

hypodermic syringe and a bottle of hormone preparation are all that is necessary to tackle all and every case of bovine sterility. There is a tendency to lose sight of the fact that endometritis of one form or another is by far and away the commonest cause of sterility in this country and that ovarian trouble is by comparison relatively unimportant. In the author's opinion, based on experience gained in making some hundreds of rectal examinations and treating and advising the line of treatment of hundreds of cases of bovine sterility, ovarian upset at the very outside is not responsible for more than 15 per cent. of the breeding trouble in cattle in this country. In some countries, notably New Zealand and Switzerland, for reasons to be discussed later, the ovaries are responsible for the majority of instances of infertility in the cow.

The Oestrous Cycle.—Before proceeding further it will be as well to consider the oestrous cycle in the cow.

The anterior pituitary body elaborates a number of hormones including the gonadotrophic hormones and of these the follicle-stimulating hormone controls maturation of the Graafian follicle. Another (the luteinising hormone) causes rupture of the follicle and growth of the corpus luteum. A third hormone, oestrin, produced in the follicle, brings about increased vascularity and enlargement of the uterus and vagina, together with the well-known psychological evidence that the animal is in service. In the cow oestrus normally lasts from one or two hours up to 24 hours, depending to a large extent on the weather, feeding, etc., but in certain diseased conditions the period is greatly prolonged. After oestrus the uterus returns to normal if no conception has occurred. It is important to make oneself thoroughly acquainted *per rectum* with the uterus during oestrus. The horns are enlarged and erect and the condition must not be confused with endometritis. This is an unfavourable period to carry out a rectal examination for diagnostic purposes as the physiological changes are likely to mask any trouble present.

Owing to the short oestral period there is little risk of a normal cow being served at the wrong time, although a double service—when the cow just comes into oestrus and when she is "going off"—is an advantage. Ovulation occurs about 36 to 42 hours after the onset of oestrus. Observation shows that, generally speaking, where a cow has not conceived, ovulation takes place in each ovary alternately. Some blood escapes through the walls of the engorged capillaries, particularly in an area of the vaginal mucosa just in front of the urethral orifice. This blood is liable to escape from the vulva about 72 hours after oestrus.

When the follicle has ruptured, the layer of cells lining the cavity proliferate rapidly and produce a corpus luteum. This body atrophies if fertilisation has not occurred. In the normal cow oestrus occurs every 20 days.

Fertilisation takes place at the fimbriated end of the Fallopian tube. If pregnancy supervenes the corpus luteum persists and produces a hormone—progesterone—which, in addition to other functions, inhibits oestrus. Towards the end of pregnancy, relaxation of the pelvic ligaments and mammary secretion are stimulated by the hormones relaxin and prolactin respectively, and a posterior pituitary hormone brings about uterine contraction.

One will often find that the sooner after calving a cow is "bulled" the more likely she is to hold. Animals which are housed a great deal are liable to come into oestrus without the outward manifestations of this condition. With some of the modern byres the cows get less exercise than formerly because they are not turned out to water, and this phenomenon is, of course, much more commonly encountered during the winter months than at other times. "Silent heat" is of short duration, and can be overcome by feeding green food when available and giving plenty of exercise if possible, or gonadotrophic hormones can be used or a corpus luteum expressed, but usually the bull can detect animals in oestrum and it is a good plan where it can be adopted, to lead the bull around the byre at least twice a day.

Some animals fail to come into oestrus; this trouble, together with "silent heat," constitutes the majority of cases of non-infectious sterility. This anoestrous can be overcome by expressing any corpus luteum present in an ovary, for within a week of this operation the animal comes into oestrus which may be "silent," but a normal oestrus will usually occur 20 days after. The whole of the corpus luteum must be carefully removed, and completely detached from the ovary, otherwise it continues to influence the oestral cycle. Another line of treatment is the hypodermic injection of follicle-stimulating hormone, which, unfortunately, is expensive, and the results are variable, but the method must be adopted where there is no corpus luteum or where the latter is embedded deeply in the ovary and cannot be expressed. We are now experimenting with the synthetic preparation mentioned earlier, in the treatment of this condition.

Cystic ovaries, as has already been stated, frequently result or at least appear to result, from endometritis. A cyst is a follicle which has failed to rupture—usually fibrosis has given rise to a toughened tunica albuginea which prevents ovulation and the follicle continues to enlarge. Lack of luteinising hormone also leads to this condition. Pressure of follicular fluid leads to degeneration and disappearance of the ovum. The large quantities of oestrin produced lead to the well known nymphomaniacal symptoms. A withdrawal of lime salts from the bones occurs and this predisposes to fractures which are liable to occur if the animal slips whilst trying to mount other cows. Such cases are best kept away from the rest of the herd. In old standing cases the uterine horns are slack and tend to diverge at a greater angle than usual, and physical changes of a bull-like nature are assumed.

Treatment, if it is to be adopted, should start as early as possible. If there is an accompanying endometritis it must be dealt with. Cysts, which may be single or multiple, should be ruptured through the rectal wall. This operation should be repeated in ten days, for one must aim at re-establishing the normal oestral cycle through the formation of a corpus luteum. Success has been reported from the use of very large doses of Prolan A given in oil.

Nymphomaniacal symptoms are sometimes encountered in animals in which no cysts are discernible in the ovaries.

The ovaries form an integral part of the endocrine system and consequently are affected by a number of factors, including mineral deficiency, vitamin deficiency (if such a condition occurs in the cow spending part of her time out of doors), hormone and

glandular derangement in other parts of the body, etc. Thus, ovarian trouble in cattle is rife, as has already been mentioned, in Switzerland and New Zealand, where mineral deficiency is common. In certain herds in this country one meets with a high incidence of sterility due to delayed ovulation, the ovum not being liberated until perhaps five to seven days after oestrus, by which time the spermatozoa have perished. My colleague, Mr. J. S. Willcox and I, investigating these cases, have obtained evidence which suggests that the condition is due to a manganese deficiency, which Kemmerer and his co-workers have shown will lead to irregularity in the oestral cycle in mice; certainly it is met with where heavy applications of lime have been made to the pastures, and lime is known to lock up the manganese in the soil thus rendering it unavailable for the plant life, and for any livestock feeding thereon. The trouble is likely to be met with particularly on those farms where grass-drying plants are in use; not that the drying of the grass is to blame, but rather it is the liberal application of artificial fertilisers (including lime) which is practised for the purpose of obtaining the necessary constant supply of young grass. Excellent results have been obtained in these cases by feeding manganese sulphate at the rate of 1 gm. per day. A 4 per cent. solution is used and by means of a whisky measure, fitted in the neck of the bottle, the requisite amount of the solution is run into each cow's food, and since the amount of liquid is small, it adheres to the food, and the entire dose is consumed with the minimum of trouble. A number of blood samples have been analysed, and the results of this work will be published later.

As an example of glandular derangement in other parts of the body, high yielding cows are often difficult to get into calf. This is probably due to the fact that the anterior pituitary gland, being associated with mammary secretion, is overtaxed, and does not exert the influence it should on the ovaries.

Whatever the cause of sterility in the cow, if she keeps turning to the bull, it would appear that constant bulling only aggravates the trouble.

Sterility in the Bull.—This is not at all uncommon although many farmers are only too ready to blame him unjustly if infertility becomes widespread in the herd. I think it is the experience of most practitioners that by the time they are called in to a herd to deal with breeding troubles, the farmer has usually tried two or more bulls in an effort to overcome his difficulties.

Infertility in bulls can be due to a number of conditions, including orchitis (usually due to *Br. abortus*); cryptorchidism; adhesions in the prepuce, preventing complete extrusion of the penis; lameness, adiposity, and foreign body in the reticulum interfering with the animal mounting the cow. In connection with orchitis, it should be pointed out that acute inflammation in one testicle can lead to degeneration of spermatogenic tissue in the other due to the high temperature generated.

To examine a bull one should pay attention to the way in which he mounts females and to the way he draws his penis and "jumps." Semen should be examined microscopically, a drop preparation being used to give an indication as to whether the spermatozoa are motile. The semen can be obtained by means of an artificial vagina or from the vagina of a cow or by massaging the bull's seminal vesicles. A normal ejaculation should be about 5 c.c. in volume, and consist of a thick milky suspension. A watery ejaculate usually has a low sperm count, whereas an excessively yellow ejaculate denotes the presence of pus. Smears can be made and stained to examine for size and shape of spermatozoa. Some abnormal spermatozoa are found in all samples of semen but these abnormal specimens should form but a small percentage of the whole. The nature of the abnormalities gives an indication as to the site of the trouble in the bull's uro-genital tract; thus sperms without heads and with twisting and looping of the tails are the commonest abnormalities, and are due to infrequent service causing prolonged retention of the spermatozoa in the seminal vesicles or to abnormal composition of the accessory secretions. Giant or dwarf spermatozoa and those which are double headed or have protoplasm attached to the head result from pathological changes in the germinal tissue. Sperm counts and respiration tests can be carried out by laboratories to which semen should be sent in special vacuum flask containers. Within normality the count varies from 300,000 to 1,200,000 per c.c. and a low sperm count will lead to infertility in spite of the fact that only one spermatozoon is necessary to fertilise the ovum. It is important that whenever trichomoniasis or corynebacterial metritis are met with in a herd, the bull's sheath should be syringed out with a weak antiseptic solution after each service.

In conclusion, I should like to say that since breeding troubles cause such an enormous loss to the dairying industry, this is a work, particularly at the present time, of very real national importance, which the veterinary profession alone is in a position to undertake. If half the barren cows could be got into calf, what a tremendous benefit it would be to this country, and if this task were properly tackled with a systematic examination of all cows at regular intervals, I am certain that the infertility could be reduced by at least 60 per cent. to 70 per cent.

Secondly, is not veterinary gynaecology of sufficient importance both to the country and to the profession to merit its being taught in our colleges as a separate subject? The foremost Continental veterinary schools, especially those which have made most headway in the study of bovine and equine sterility, *e.g.*, Copenhagen, think the subject worthy of special teaching. If such an arrangement were adopted, venereal diseases, including brucellosis and trichomoniasis, etc., could be studied in the gynaecology course, together with sterility and obstetrics; the latter at present constitute only the Cinderellas of the surgical course.

Summary

(1) Cases of bovine sterility can be classified as infectious and non-infectious.

(2) The various regions of the female genitalia are considered together with abnormalities likely to occur in each region.

(3) Endometritis is the commonest cause of bovine sterility.

(4) Infertility in the bull is considered briefly.

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Discussion

Opening the discussion Professor Robb asked the speaker how he ruptured ovarian cysts—was it necessary to use a trocar? He would like to know what was the earliest stage at which pregnancy could be diagnosed in the cow—what were the early indications?

Mr. H. McIntyre Wilson asked Mr. Hignett if he thought double service gave better results than single service. Did he recommend the hot-stage to facilitate microscopic examination of semen? He had hoped that a comparison would have been made between artificial and natural service, and would have liked to have heard more about artificial insemination. Mr. Wilson then described a practical method of despatching semen to a laboratory.

Mr. J. O. Powley paid tribute to the essayist, whom he said he had had the pleasure of watching at sterility work. He was particularly interested in the manganese deficiency, as he had known the herd first concerned and had been instrumental in getting Mr. Hignett to investigate the problem when he was at the Royal Veterinary College.

He would like the speaker to point out his reasons for believing the trouble was not due to other factors, since sterility was common in parts of Yorkshire where liming had been neglected.

Mr. D. Campbell said he would like to know what Mr. Hignett's experience had been with the use of live vaccine, both in cows and heifers. It was his experience that the vaccine definitely predisposed to sterility, particularly in heifers.

The Reply

Mr. Hignett, in reply to Professor Robb, said that he had always been able to rupture ovarian cysts in the cow by pressure exerted through the rectal wall. In the case of the mare he usually had to use the trocar, and the cysts were ruptured through the vaginal wall.

Early pregnancy could be diagnosed at five weeks, and evidence consisted of the cow not returning to service; on rectal examination there was some enlargement of the pregnant horn—and this usually took the form of a slight bulge rather than a uniform enlargement, the bulge occurring at the curvature of the horn; in the corresponding ovary there was a corpus luteum of pregnancy—rarely there was a corpus luteum in the other ovary, and in this case it is assumed that the ovum, after descending the Fallopian tube, has come back to the bifurcation and then gone forward in the other horn.

Without considerable experience an opinion as to pregnancy should not be given until nine weeks after service.

In answer to Mr. Wilson the speaker pointed out that in the paper he had recommended double service to increase breeding efficiency. The hot-stage was undoubtedly of value in the examination of semen.

Mr. Hignett was firmly convinced that artificial insemination gave no better results than did natural service. He did not think it would ever be adopted on a large scale in this country, where there were plenty of first-class bulls. It was a far different proposition in Kenya, the Argentine and Russia.

Replying to Mr. Powley, Mr. Hignett said that the sterility he had encountered in the areas mentioned, where liming had been neglected, in his experience always followed infection with *Br. abortus*. He would like to point out that the delay in ovulation had not been discernible after the administration of manganese sulphate.

He was particularly interested in Mr. Campbell's remarks regarding vaccination, because it was his experience that sterility in heifers frequently followed the use of the live contagious abortion vaccine.

CLINICAL COMMUNICATIONS

An Unusual Case of Dystokia

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Subject.—A white Shorthorn cow, three and a half years old.

History.—This cow had been served in January, 1938, to the best of the owner's knowledge, with five or six other cows. These other cows had calved in October and November, 1938. The white cow had shown no signs of oestrus, had gone dry in August, but had given no indication of calving. The owner decided the cow was not in calf and had started to feed her. But although apparently normal in every way the cow was poor and seemed unlikely to fatten.

I was consulted on February 22nd, 1939. The cow was then straining violently and refusing to eat or drink.

Examination.—I found the cow straining violently and in very great distress.

On examination per vulva, a foreleg and head of a well-formed calf were easily felt in the vagina. The walls of the vagina were very dry and inflamed. It was impossible to pass the hand into the uterus; the *os* appeared to be constricted around the neck and one shoulder of the calf.

Embryotomy was decided upon.

The Operation.—Epidural anaesthesia was induced, and in four minutes the cow had stopped straining and was standing quietly. A noose of strong cord was passed round the lower jaw of the calf and the head was pulled out as far as possible, then amputated. This was also done in the case of the forelimb. The calf was then pushed back into the uterus. It was then found that a strong fibrous band stretched across the vagina, some 3 inches from the *os uteri*. The head and neck of the calf had apparently been over the top of this band and the foreleg below, so preventing parturition. This band was removed with scissors. The hand was now passed into the uterus, the remaining foreleg secured and the calf easily delivered, together with a large quantity of thick white purulent liquid.

Treatment.—The uterus was well washed out with normal saline and four antiseptic pessaries inserted; the cow was given a good dose of purgative mixture, and this was followed by an arsenic-iron tonic.

The cow made an uneventful recovery and was in a short time sent away fat.

Observations.—The walls of the uterus were greatly thickened, and there was no trace of any cotyledons. This extensive thickening of the uterus no doubt prevented the inroad of infection. The calf was of normal size but partially decomposed.

The question arises as to the length of time the calf had been dead. It would appear from the history of the case to have been lying dead in the uterus for two months.

Secondly, with regard to the fibrous band, the year before the cow had delivered without aid a normal live calf; the presumption is, therefore, that this band had formed between the first and second parturition. It seems probable that this band had its origin from some accident to the vagina during the first parturition.

Ingrowing Hair on a Spaniel's Foot

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CHEPSTOW

Subject.—Four-year-old Springer spaniel.

History.—Had been subject to skin trouble from a puppy, and 12 months ago was affected with a condition thought to be eczema on the same foot as that described below.

In August the dog was noticed to pay a great deal of attention to the left hind foot, the hair being removed by constant licking and biting. The skin became thickened, and a clear serous fluid issued from its surface.

The affected area was situated at the front of the foot, extending upwards from the top of the digits, a distance of 3 inches.

Diagnosis and Treatment.—At first the condition was thought to be a moist eczema and calamine lotion was applied, the foot being bandaged to prevent the dog removing the dressing. Further dressings of zinc oxide, Icthyol and sulphur were tried, as there was no relief and the irritation caused by the condition was intense, the dog biting the foot until it was bleeding and raw.

The affected area appeared to spread and became a circular patch, its lowest point being at the top of the digits. Serous fluid oozed continually from the surface. Later most of the discharge issued from two openings which appeared, one below and one above the area described.

The whole of this area of thickened skin was incised through its depth with five vertical and closely parallel incisions, and antiseptic dressings applied. Relief was apparent, but after a week the irritation returned and the discharge was issuing from the original openings described above. On probing the latter, it was suspected that a deep-seated track connected them, and a deep incision was made from the bottom opening to the top one. A transverse incision was made across this, and the resulting four flaps of skin reflected. This revealed a shallow cavity containing a mass of loose hairs which were picked out with forceps, being at first mistaken for fibres from a barley awn. On further examination of the under-surface of the reflected flaps, it was found that a great number of hairs were actually growing inwards.

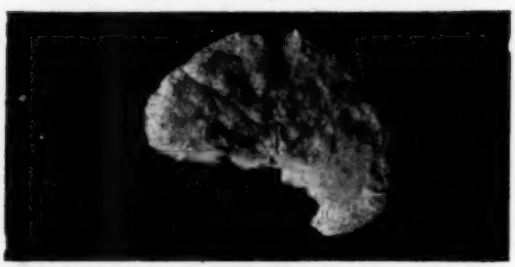

FIG. B.

The only course left open seemed to be removal of the diseased skin—an area of about 4 square inches. This was done and antiseptic dressings applied after cauterising severely.

Sequelae.—Local irritation ceased immediately and the wound was healed in 17 days.

Cause.—The dog being too young for a new growth, it can only be suggested that this was an ingrowth of skin due to over-development of a natural fold or crease which is present in that region of the foot.

Accompanying photographs.—Fig. A: Lateral view: clearly shows abnormal hair growing on inner surface (concave side). Fig. B: Full view of inner surface.

SLAUGHTER OF OLD COWS FOR CANNING

DUBLIN CHIEF VETERINARY OFFICER'S DISCLOSURES

The position arising out of the slaughter of old cows for canning purposes in County Dublin was discussed at a meeting of the Dublin Board of Health on December 17th, when the monthly report of the chief veterinary officer (Mr. John A. Flynn) came up for consideration.

The *Irish Times* reports that Mr. Flynn stated that a Dublin city trader commenced slaughtering old cows for canning purposes in a slaughterhouse in South Dublin. This had imposed considerable work on the veterinary and sanitary staff, as rigid inspection was required to see that no diseased animals were sent to the city. The incidence of tuberculosis in aged animals was very high, and so far one carcase and portions of others had been seized. The slaughtering had discontinued during the latter part of the month, but had now recommenced.

Slaughtering of animals in the county by city meat traders had reached such proportions that it was impossible to ensure adequate inspection with the staff available.

Inspection revealed an almost total disregard of the regulations relating to the clipping and grooming of cows. Under the National Free Milk Scheme, 840 pints a day had been distributed in October.

In reply to Mr. W. Rollins, Mr. Flynn said that it was absolutely impossible to examine every animal, because slaughtering took place six days a week and a part-time official, receiving £100 a year, could not be expected to stay at a slaughterhouse all the time.

Mr. Fogarty: Can a person can a tuberculous animal? Mr. Flynn suggested that certain animals might not be inspected.

Mr. Foggarty: It is an extraordinary state of affairs.

Mr. Rollins: I think that it is a shocking state of affairs, and the report merely touches the fringe of the matter. We are paying two guineas a week to provide treatment for tuberculosis cases in the hospitals.

Mr. J. J. Clare said that a copy of the report should be sent to the Department.

Mr. Flynn: The Department already has refused to give extra assistance to help in dealing with the problem.

In reply to the Chairman (Mr. J. T. Ennis), the Chief Veterinary Officer said that there was nothing to prevent slaughtering on Sundays in the county area. Slaughtering could take place during the 24 hours.

He added that there was adequate provision for inspecting meat in the city. Meat was not allowed out of the city abattoirs until it had been inspected.

Dr. Harbison, County Dublin M.O.H., said that the Department had made meat regulations, but the Department knew that there was not sufficient veterinary staff to carry them out. The regulations were carried out in the abattoirs.

It was decided to refer the matter to Dr. Harbison and Mr. Flynn, who are to consult the Department.

ABSTRACTS

[OBSERVATIONS ON COPPER POISONING. Eden, A. (1940.) *J. comp. Path.* **53**. 90.]

Copper poisoning is discussed in the light of experimental work on the distribution of copper in the body in normal and poisoned rabbits and sheep. The normal range of tissue copper content from animal to animal is wide. From tissue to tissue the copper content does not vary greatly, but liver shows the highest values, and muscle the lowest. In acute copper poisoning, the level of copper content was increased throughout the body, but not sufficiently to raise the value for the liver beyond that which had previously been found in some normal animals. It does not therefore appear that copper is stored by the tissues in states of overdosage. A high value in blood and urine is more significant than a high tissue content.

Chronic copper poisoning is likely to be rare in this country, since animals are unlikely to have access to a large enough quantity for a long enough time. It was found difficult in these experiments to induce sheep to eat a diet containing a daily dose of 1·5 grammes copper sulphate. When this amount was given as a drench symptoms appeared in from 30 to 80 days, death occurring soon afterwards. During the earlier period of dosage the blood copper rose slightly, followed, on the appearance of symptoms about one week before death, by a very sharp rise. High values were found for the *post-mortem* content of the tissues, especially the liver and kidneys. The blood showed haemolysis, and the haemoglobin was low. The liver was cirrhotic and bile stained, and the kidneys were congested. The history of these cases suggests that copper is well tolerated for some time. Absorption is low even if large amounts are ingested, and elimination in the bile, urine, and possibly *via* the intestinal wall, is adequate. Prolonged heavy dosage appears to produce functional damage to these excretory organs, with a consequent rise in blood copper, slight at first, but very marked as sudden total breakdown in the mechanism of elimination occurs before death. In discussing the diagnosis of copper poisoning the author stresses that biochemical examination of the tissues is insufficient without the clinical history and *post-mortem* findings.

J. B. B.

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[N-BUTYL CHLORIDE (B.P. 78·5) AS AN ANTHELMINTIC. Trum, B. F. (1940.) *Vet. Bull.* (*Suppl. Army Med. Bull, U.S. Army.*) **34**. 20.]

Six horses, five of which were over 17 years old, were given 0·1 c.c. of N-butyl chloride per lb. body weight in ten times its volume of linseed oil after a 36-hour fast with water. A 13-year-old mare was given "a therapeutic dose" of N-butyl chloride in linseed oil after an 18-hour fast; and an eighth horse, the age of which is not stated, was given 250 c.c. of undiluted N-butyl chloride without any fast. All the horses dosed after a 36-hour fast showed inappetence and uneasiness, but no rise of temperature. The liver and kidney of one were examined, but no histo-pathological changes were found; the faeces and urine of all had a vile indescribable odour for two days after the dosing, and the entire mucosa of the glandular portion of the stomach either sloughed off and was found in the faeces or was in process of sloughing when *post-mortem* examinations were made four to five days after dosing. The mare dosed after an 18-hour fast showed very little ill-effect or bad odour in the urine and faeces, and there was no sloughing of the stomach mucosa. The horse given 250 c.c. of N-butyl chloride without a fast did not show even signs of gastritis and ate normally and heartily. In spite of the severe effects of the drug on the stomach mucosa in horses dosed after a 36-hour fast, *Gastrophilus* larvae in the stomach of all of them were still alive at *post-mortem* four days after dosing. Apparently only three of the horses had nematode parasites and there were so few that the work gives no information about the anthelmintic value of N-butyl chloride. The horses were not examined for parasites before dosing, but at *post-mortem* the whole of the contents of the alimentary canal were thoroughly searched with a hand lens. The few strongyles found appear to have been alive when they were found or when they were passed in the faeces before *post-mortem*. [It is difficult to know what the author means by the statement that horse No. 4 passed "82 trichomonas (Cylicostomum)"; this horse passed 12 *Oxyuris equi* also after dosing, but this is hardly sufficient evidence for the author's conclusion that N-butyl chloride "was 100 per cent. efficient against Trichomonas and *Oxyuris equi* in horse No. 4." The statement that N-butyl chloride is not an efficient "vermicide" for *Gastrophilus* sp. larvae seems to be supported by the evidence adduced. There are no references to the work of others who have used this drug.—*Abstr.*]

G. L.

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[CARBOHYDRATE TOXAEMIA IN FAT STEERS. Hastings, C. C. (1940.) *N. Amer. vet.* **21**. 149-151. (3 figs., 1 table.).]

This condition was met with in cattle fed on a heavy ration of concentrates with a reduction of roughage. The author has not found it in cattle fed on pasture.

A herd of 196 fat Hereford steers of about 1,000 lb. weight had been allowed access to a self-feeder containing shelled corn and to oat straw in racks. They were also given 1½ lb. of extracted soy-bean meal per head per day and powdered limestone at the rate of about 1 lb. per ten steers per day. After about nine months ½ lb. per day of a commercial molasses feed was given.

After ten months on this diet four cases occurred. These showed subcutaneous swellings commencing usually in the region of one shoulder, but the limbs and other areas of the body were also affected, in some extensively. Unless severely affected, animals were not off their food and when put on to pasture or hay, recovery occurred in about ten days; there were no fatal cases. Serum calcium and inorganic phosphorus were within the normal range.

A. B.

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[EFFECT OF PROTEIN ALIMENTATION ON THE SECONDARY SEX RATIO OF OFFSPRING OF RATS. Hoelzel, F., Da Costa, E., Carlson, A. J. (1939.) *Proc. Soc. Exp. Med. Biol.* **40**. 334-335. (1 ref.).]

Girou's theory that the better-nourished parent tends to determine the same sex in the offspring was tested by mating rats fed on a high protein diet (about 40 per cent. casein) with rats fed on low protein diets (about 10 per cent. casein). The study occupied 15 months during which 652 litters were obtained.

Matings of normal and high-protein males with low-protein females yielded a sex ratio of 145 : 100. Reversing the diets in the same animals transformed the ratio to 92 : 100. The figures are regarded as significant, but not conclusive, and further work is being undertaken. D. D. O.

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[INFECTION OF A BOVINE BY HUMAN TYPE (*MYCOBACTERIUM TUBERCULOSIS*). Reid, J. *J. comp. Path.* **52**. 318-321. (2 tabs., 6 refs.).]

A case of bovine tuberculosis caused by the human strain of the organism is recorded. The subject was a 15-months-old Guernsey heifer. Notice was first directed to the animal at an official tuberculin test when an anomalous reaction was elicited to Cambridge synthetic tuberculin. A retest ten days later gave positive reactions to both bovine and avian tuberculins. At autopsy no macroscopic lesions of tuberculosis were apparent. Suspensions prepared from the parotid, pharyngeal and submaxillary glands, however, produced acute generalised tuberculosis at the seventh to eighth week in three guinea-pigs. Of two rabbits inoculated one showed generalised infection, and the other had a localised lesion at the point of injection. A luxurious growth was obtained by culture on both glycerine-potato and glycerine-egg media. Further quantitative biological tests showed that the organism was of the human type.

D. D. O.

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[FRIGHT DISEASE (RUNNING FITS): NOT A DIETARY DEFICIENCY. Schlotthauer, C. F. (1940.) *N. Amer. vet.* **21**. 355.]

A discussion of the relationship between deficiency of vitamin B_1 in the diet and canine hysteria, in which the author refers to certain experiments he has conducted. No details are given but he claims that feeding dogs for about a month on diets known to be deficient in vitamin B_1 caused anorexia without any signs of hysteria or other similar mental disturbance. Similar findings were obtained with canned food autoclaved to destroy the vitamin. In every case the animals appeared quite normal apart from the anorexia. Following the subcutaneous administration of a single dose of thiamin the dogs again ate the food which they had refused. A. R.

[It may be pointed out that the work reported hardly justifies the use of the sub-title, *viz.*, "Not a *Dietary* Deficiency."—Editor, *Vet. Rec.*]

MIDGET COWS

Two years ago, Otto Grey, a dairy farmer in Oklahoma, U.S.A., found a freak, dwarf-like cow, 33 inches high, in a neighbour's herd. When he checked its history he found that it had just calved to a normal bull so he bought it and the calf. Since that time he has, through breeding and purchasing, developed a herd of nine, including one midget bull, the latter being the third calf of the original midget cow. His idea is to build up a midget herd. It is stated that these midget cows, which range from 30 to 37 inches in height, develop and fatten normally. They produce an average of 35 lb. to 41 lb. of milk per day, eat half as much as a normal cow and stay fat and maintain production. The milk is rich in butter fat; in fact higher than that of cows of normal size. Mr. Grey's idea is to fix a strain of midget cows with the foundation he has secured and he is now scouring the whole of U.S.A. for more of the type.—*Scottish Farmer.*

REPORT

[THE HANNAH DAIRY RESEARCH INSTITUTE: Eleventh Annual Report for the Year ending March 31st, 1940.]

The advent of the war has not made it necessary for the Institute to deviate to any great extent from its programme of work for, as stated in the section relating to "progress," it was already concerning itself with problems of self-sufficiency relating to foodstuffs and their storage, to the conservation and utilisation of milk and its by-products and to the control and eradication of cattle diseases.

Details of the work follow. A survey was made with the object of discovering what contribution could be made to close the feeding-stuffs gap by tapping fresh sources of supply and stimulating improvement in methods. It is estimated that, by a determined effort, a 33 per cent. contribution could be made as against the 10 per cent. envisaged by the Government. In illustration of how this could be done the policy adopted on the institute farm is instanced. Ploughing up and re-seeding, grass-drying and the production of kale, swedes, linseed and crops available for winter feeding, all play their part in this scheme.

The enquiry into the protein requirements of the dairy cow has been continued and the factors influencing mould growth in stored foods investigated. The latter appears to be rather more a question of the atmospheric humidity of the store room than of the hygroscopic properties of the food concerned. It was shown that for the safe storage of dried grass the moisture content of the air should not exceed 13 per cent. (*e.g.*, 67 per cent. relative humidity).

Problems of milk and lactation are also under consideration and in the sphere of animal disease the control of mastitis by a combination of laboratory and farm tests, improved dairy hygiene and treatment, is being tested.

The report is well illustrated by photographs of the various practical processes taking place in the Institute and on the farm (*e.g.*, grass-drying, silage making, etc.).

N. S. B.

"PEDIGREE STOCK BREEDING A NATIONAL ASSET"

Chairman's Plea to Annual Meeting of Smithfield Club

Mr. A. Thomas Loyd, who presided over the annual general meeting of members of the Smithfield Club, made a plea to members "to preach the gospel of pedigree stock breeding, as a national asset," not only during the progress of the war, but upon its conclusion.

He went on (reports the *Farmers' Weekly*): "The example of our Club must be that of keeping the Government ever mindful of the pledge it has given to agriculture. There is just a danger that many agricultural practices will be put into cold storage, but it is an absolute necessity that the pedigree side of British stock-breeding shall never be allowed to be ignored. It still is a vast industry and the country must be kept ever mindful of what it stands for." Mr. Loyd said he was convinced that the Government would not let agriculture down, but, as members of a Club which had been helpful for so long in placing before the country the demands of the farming industry, it was their duty to discharge the definite mission of upholding the merit of the pedigree herds and flocks of the nation.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Feb. 6th.—Central Veterinary Society: Council Meeting 11 a.m.; Annual General Meeting 12 noon; Ordinary General Meeting 2 p.m.—all at the Palmer Hall, West Street, Reading.

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National A.R.P. for Animals Committee

COMPENSATION FOR LIVESTOCK CASUALTIES

The Chief Executive Officer points out the importance and urgent necessity of all returns of livestock casualties being sent to N.A.R.P.A.C. headquarters without delay. It is desired to stress that the authorities at Somerset House now view the details of these casualty reports as the official source of information on which compensation claims are based. It will, therefore, be appreciated that unless the casualties are officially documented delay and difficulty may be experienced by owners in securing settlement of their claims.

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N.V.M.A. Watch Presentation Scheme in Aid of Veterinary Benevolence

It will be recalled that in our issue of December 21st the President, N.V.M.A., commended to the interest and support of our readers a scheme (detailed in the Notes and News columns of that issue—page 886) in connection with a competition for a gold watch in aid of the veterinary benevolent funds. In expressing the hope that the process of filling up the subscription cards is making good progress, we would take this opportunity of making appreciative reference to the fact that the Association is running the competition at the suggestion of Mr. W. Nairn, M.R.C.V.S., of Erichtbank, Blairgowrie, to whom all concerned are much indebted, also, for the presentation of the gold watch.

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PERSONAL

MR. GEORGE BOWMAN'S RECOLLECTIONS OF "THE HEYDAY OF THE HORSE"

On December 22nd Mr. George Bowman, M.R.C.V.S., of Leeds, attained the great age of ninety years and in extending hearty congratulations to him on behalf of his colleagues in the profession, we would take the opportunity of reproducing from the *Yorkshire Evening Post* some of his "happy memories of the days when Leeds was a town of horses," recorded in an interview—for first-hand impressions and experiences of those whose interest was centred in the horse in its heyday must needs have a strong appeal for all members of our profession.

Mr. Bowman, who graduated at Edinburgh in 1872, is fourth in the list *Chirurgorium Veterinarium Collegii Regii Seniores* and, to introduce the *Post's* account, "Now when only an occasional horse is seen in the city's streets, Mr. Bowman thinks of the changes brought about by the development of the internal combustion engine. From a window in the Woodhouse Lane house in which he has lived for 55 years he watches the stream of mechanically propelled traffic—and wonders what has become of the fodder merchants, the blacksmiths, the saddlers and the harness makers who once were to be found on or near all the town's main roads.

"Mr. Bowman has lived with (and for) horses ever since he was old enough to know anything about them. In his home there hangs a magnificent print of Doncaster, winner of the Derby in 1873, and there is a photograph of a Leeds police horse—Mr. Bowman had much to do with the Leeds police and fire brigade horses for many years—which took prize after prize and was described by Lord Lonsdale as the best fire brigade horse he had ever seen.

"'When I got my diploma in the early 70's,' Mr. Bowman says, 'I went to Sledmere to be assistant to my brother, also a veterinary surgeon who was with Sir Tatton Sykes. There I had something to do with Doncaster, whose name before he was sold to Mr. Merry (his owner when he won the Derby) was that given him by old Sir Tatton—All Heart and no Peel. He was sold at the Doncaster sales, and took his racing name from the town at which he was sold.'

"In 1881, when Mr. Bowman set up in Leeds, he had his first 'infirmary' in Dr. Teale's old stables, where Harewood Barracks now are. He soon found that there was work, and plenty of it, in Leeds and district. He remembers when there over 600 horses pulling tramcars in the town, and another 400 pulling buses, and he had in his care the horses of over a hundred Leeds citizens who had carriages and pairs or pony carts.

"He used a pony cart to get round in when it was not convenient for him to ride, but he was never happier than when on horseback.

"He became veterinary surgeon to the Leeds Corporation, and looked after the Corporation's horses for 41 years. He kept an eye on the pit ponies at half a dozen West Yorkshire collieries. He looked in professionally at stables at Farnley Hall, Weston Hall, Ashfield, Harewood House and so on and at none of them would there be, in those days before the motor car, fewer than 35 or 40 horses.

"He rode steeplechase winners before and after he came to Leeds. He tells of victories in the Ebor Plate and the Southport Hunt Cup in 1879, and talks affectionately at Monteagle, the best steeplechaser he ever owned. He was at Sledmere when he won the Ebor Plate and the Southport Hunt Cup, and though he remembers many profitable and happy days in Leeds, he says longingly that the best days were those at Sledmere when he was 'on horseback all day long.'

"No more than five or six years have gone since last Mr. Bowman held a horse's reins. He mounted one of the Leeds police horses when he was in the middle 80's, but 20 years and more have gone since he last took hold of the steering wheel of a motor car. He was among the first in Leeds to own a car and well remembers it, for the clutch was fierce. But he stuck to his car, finding it, as he had to admit, more useful. Only occasionally, however, could he be pursuaded to drive, and he says with a smile that his longest spell as a motor car driver was one of about three months early in the last war.

"'I never felt comfortable at the wheel of a car,' he says, 'but I always was comfortable on or behind a horse.'"

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Marriage.—LAUGIER—HALL.—On December 25th (by special licence) at St. Mary's Church, Bungay, George Victor Laugier, M.R.C.V.S., to Mavis Hall, both of Bungay.

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R.C.V.S. OBITUARY

SMITH, Charles Secker, 7, Huddersfield Road, Barnsley, Yorks. Graduated N. Edinburgh December 21st, 1894. Died December 28th, 1940; aged 70 years.

MR. C. SECKER SMITH, M.R.C.V.S.

Mr. C. S. Smith, whose death, which took place on the 47th anniversary of his qualifying, we record with much regret, was well known in South Yorkshire as a practising

veterinary surgeon and as Veterinary Inspector under the Barnsley Corporation, a position he held for over 40 years and in which he succeeded his father, Mr. Ben Smith, F.R.C.V.S., who was appointed to the post when it was created. He was for many years a local inspector under the Ministry of Agriculture and Fisheries. "In private practice he was, perhaps, most widely known for knowledge and understanding of pit ponies and his skill in the treatment of their ailments and injuries," states the *Barnsley Chronicle*, and continues: "Twice President of the North Midland Veterinary Medical Association, Mr. Smith was a member of the Yorkshire Division of the National Veterinary Medical Association. His main interest was in veterinary matters and in consequence he did not find much time to devote to public affairs. In the 1914-18 war he was an enthusiastic member of the Home Defence movement and spent much energy in organising collections for the welfare of sick and wounded soldiers.

"In failing health over a long period, Mr. Smith retired about two years ago and was succeeded in practice by his then assistant, Mr. James Marshall, M.R.C.V.S., who was also appointed to the local government position.

"Mrs. Smith died nearly four years ago and there are two sons and two daughters."

The funeral, at which the Rector of Barnsley (Canon W. E. Wilkinson) officiated, was at Barnsley Cemetery on the Tuesday, preceded by a service in St. Mary's Parish Church. Amongst the large attendance were Mr. James Marshall, M.R.C.V.S., of Barnsley (also representing the Yorkshire Veterinary Medical Association), Mr. D. P. Grubb (Principal of the Barnsley Mining and Technical College), and Mr. P. W. H. Taylor (Librarian).

Among those who sent wreaths were the Principal, Teaching and Office Staffs of Barnsley Mining and Technical College, Mr. and Mrs. J. Marshall, and the members of the Yorkshire Veterinary Association.

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MEAT INSPECTION

In a circular letter (No. 2218) recently issued by the Ministry of Health to local authorities in England and Wales it is stated that, "with a view to securing a greater measure of uniformity in applying the criteria of meat inspection, the Minister of Food, in consultation with the Minister of Health, has appointed a number of qualified Technical Advisers on Meat Inspection who will be available to discuss with local authorities and their officers matters in connection with meat inspection and associated problems under the Government scheme of meat control."

The communication continues, "The Minister of Health desires to take this opportunity of expressing his appreciation of the co-operation of local authorities with the meat control services of the Ministry of Food. He desires at the same time to invite local authorities to avail themselves as fully as necessary of the advisory services of the officers of the Ministry of Food, and to extend their assistance and co-operation to those officers in any matters which the latter may think it desirable on behalf of the Ministry of Food to bring to the local authorities' notice. Local authorities will appreciate that while it is essential that the interests of public health should be properly safeguarded, it is also essential, particularly in present circumstances, in order that the best possible use may be made of all available foodstuffs in the country, that no carcases or portions of carcases or offals should be condemned, unless there is definite evidence that they are unfit for human consumption. The Minister is informed that it would greatly assist the Ministry of Food if officers of local authorities when making out certificates of condemnation of meat and offals, would state specifically the actual cause of condemnation.

"While it is desired that the Public Health (Meat) Regulations, 1924, should be complied with as far as possible, circumstances may arise, *e.g.*, as a result of enemy action, in which strict adherence to the Regulations, particularly in relation to emergency slaughtering, may be impracticable. In such circumstances officers of local authorities will, no doubt, exercise discretion, in consultation, where necessary, with the local officers of the Ministry of Food."

The attention of the recipient authority is called to the provisions of the Livestock (Restriction on Slaughtering) (No. 2) Order, 1940, made by the Minister of Food, and in particular to article 6, which came into operation on December 1st, 1940, and requires the treatment with a colouring agent in certain cases of meat unfit for human consumption. In connection with this Order (the terms of which were reproduced in the *Veterinary Record* of November 23rd), the circular proceeds: "The treatment is to be carried out as soon as practicable after the slaughter or death of the livestock or horses from which the meat is derived, and, with certain exceptions, before leaving the place of slaughter or death. It will be observed that power is given to authorised officers of local authorities to examine meat which is thus subject to treatment, and I am to say that it is hoped that, so far as circumstances permit, local authorities will assist the Ministry of Food by exercising the powers of supervision which are thus given to them. If an authorised officer of the local authority upon such examination is not satisfied that the requirements of the article are being complied with in any particular case, he should bring the matter to the notice of the local officers of the Ministry of Food."

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Non-Toxicity of Colouring Agents for Meat Not for Human Consumption

Under the terms of Article 6 of the Livestock (Restriction on Slaughtering) (No. 2) Order, 1940, published in our issue of November 23rd, reference is made to the treatment of certain classes of meat, not for human consumption, by impregnation with colouring agents before being exposed for sale. An enquiry addressed to the Ministry of Food by the National Veterinary Medical Association as to whether the colouring agents to be employed have any toxic effect on dogs and cats if the stained flesh is used as food for them, has elicited the information that the colouring agents mentioned in the Order are non-toxic and that it is the intention of the Ministry that any "other approved colouring agents" shall also be non-toxic.

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MINISTRY OF AGRICULTURE NEWS SERVICE

Christmas, 1940

To think of Peace and Goodwill at this present moment in history may seem to some ironical. Millions of men, armed with the most ingenious weapons of destruction the world has ever seen, are engaged in an orgy of killing, maiming and burning. Behind them stand more millions, sweating at the furnaces to produce yet more weapons, or toiling long hours in the fields to grow food: food to nourish the fighting men and munition makers and their families, food to make room in the ships and so provide material for still more destruction. By night, many thousands go down and sleep in holes beneath the earth. A nice sort of Christmas, many would say.

And yet it may be that all the horrors and loss and beastliness that, for the moment, surround us are no more than the inevitable pain and labour when anything good is born. For are we not fighting this war that peace and goodwill may come to the earth in greater measure for more people, and permanently? We fight not only for our own freedom and security, but for the right of the ordinary people of other nations to these things and to enable them to throw off the yoke a handful of tyrants have fastened upon their necks. We fight not for such aims as the acquisition of more territory, more power, more prestige; but that men in other countries may once more call their souls their own and that they be no longer persecuted because they are of a different race or colour or creed from their fellows. Our strong right arm grows stronger every day, but only that it may win for mankind . . . more Peace and Goodwill.

Farmers are in the forefront of this twentieth century crusade and their task is no less vital because they wield peaceful weapons, such as the plough, the tractor and the reaping machine. Their part is to nourish that right arm and to see that none behind the lines goes short. Never have they had a heavier responsibility.

There is growing evidence that they are facing it with the same determination as other members of this island community, who have astonished the world with their courage. Much remains to be done. We are still far from making up for the years the locusts have eaten. But already enough has been achieved to ensure a special niche for the farmers of Britain when the great times in which we live are due to be commemorated.

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OILCAKE FOR ENLARGED DAIRY HERDS

The Ministry of Food announces that, pending the introduction of rationing, efforts are being made to provide limited additional supplies of oilcake to farmers who have increased their dairy herds. The quantities of oilcake available for these extra allocations are governed by the general supply position, and being thus limited, would only go a short way toward meeting the need of every farmer whose dairy stock has been increased since the war.

Since, however, there has been no substantial increase in the total numbers of dairy cattle, it is considered that the need for additional supplies of oilcake could and should be met in part from the surplus stocks remaining in the distributor's hands as a result of reduced demands from farmers whose herds have decreased. The Ministry of Food looks to the distributors for co-operation in the diversion of these surplus supplies to the more heavily stocked dairy farms.

Under the scheme claims for extra supplies will be considered from farmers now keeping dairy cattle on farms not previously so stocked, or from those who on taking over new farms have added to the existing stock, or have, on the advice of the County War Agricultural Executive Committees, increased their dairy herds.

Farmers should apply to their County War Agricultural Executive Committees, who will examine the claims and issue at their discretion permits for additional supplies of straight oilcake and dairy compounds. These certificates, covering a period of four weeks, may be renewed on the authority of the County War Agricultural Executive Committees. These certificates are the supplier's authority to release additional stocks or to obtain them from his regular wholesaler, etc.

The Ministry of Food emphasises that consideration can only be given to *bona-fide* claims made in respect of approved increases of dairy herds.

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"HOW DO DRUGS ACT?"

"Sympathetic magic was responsible for much ancient polypharmacy with animal extracts often of a disgusting nature, and to this may be due the lingering prejudice against animal extracts in therapy," observed Sir Walter Langdon-Brown in the opening passages of an address entitled as above (reproduced in the *Pharmaceutical Journal**) to a meeting of the Pharmaceutical Society. Sir Walter continued:—

"To this we may perhaps also attribute the popular belief in the safety and harmlessness of 'herbal remedies' in spite of the fact that some of the deadliest poisons are of vegetable origin. . . . I fail to see why vegetable drugs are the most 'natural' for animals. Surely the most natural drugs for them are those produced by their own bodies, the hormones and antitoxins. . . . Nor do we know what use the plant makes of such alkaloids for its own metabolism.

"The use of some drugs is entirely empirical, and in some instances the scientific explanation is not yet reached —for instance, colchicum for gout and salicylates for rheumatism. In other instances the rationale has only been discovered after a long interval, such as ipecacuanha in amoebic dysentery and quinine in malaria. I am, therefore, constrained to utter a plea for empiricism, especially as I still remember the scorn of the pharmacologist for the clinical belief in cod-liver oil before vitamins were discovered. And I will quote Timme's reminder that 'the abysmally ignorant South American savages who gave us cinchona bark for malaria did not even know the formula of quinine.' Thus the bark of cinchona trees as a cure for malaria was probably used by the natives long before it was introduced by the Countess Chinchon into Europe from Peru in 1638 and took its name from hers. Quinine was not isolated from it till nearly 200 years after this. Yet malaria, as its name implies, was still attributed to bad air until 1880, when a French Army surgeon, Laveran, discovered the malarial parasite in a patient's blood, and not until 17 years later was the mosquito found by Ronald Ross to be the infecting agent. Quinine was observed not to be fatal to every phase of the life history of the parasite, and the next stage was an attempt to synthesise its essential quinoline nucleus with other substances to overcome these difficulties, resulting in the making of Plasmoquin and Atebrin. Yet no one knows how the quinoline nucleus destroys the malarial parasite, or why it needs different associates to deal with different stages of its life history.

"Here we are dealing, however, with the action of a drug on an invader. If we want to get an idea of the way drugs can influence our own tissues we shall probably do this best by studying the behaviour of those substances which the body forms for its own purposes such as hormones and antibodies, as well as those highly active catalysts it obtains through food, the vitamins. In the case of the hormones, the old problem which came first, the hen or the egg, can be answered. Some hormones at least existed before a mammal was there to make use of them. Thus oestrogenic substances are to be found in the coal measures, and Ma-Huang trees in China and India manufactured ephedrine, so closely allied to adrenaline, independently of the adrenals. As evolution proceeded the increasingly complex organisms found such substances advantageous and at last learned to make them. Vitamins being so much more widely distributed in foods, the animal body has not had to go to the trouble of making them. True the last stage of the formation of vitamin A is carried out in the body, and dogs can make their own vitamin C, if we can't, though given the presence of sunlight we can make vitamin D out of the ergosterol beneath our own skins. Vitamins then for the most part are acquired needs, acquired as structure and function became more complex, though even lowly forms of life make use of vitamin D. This acquiring of a need explains quite simply what on the face of it appears a mystery. How is it that the germ of rice which is removed by polishing contains the vitamin B, which is necessary to the proper utilisation of the grain? The more starch we eat the more of this vitamin is needed for its oxidation. It was because rice in its natural state was found such a useful food that it was eaten and therefore cultivated, and it was so useful precisely because it contained both the food and the catalyst. Not until man polished the rice for aesthetic reasons did he remove the catalyst and get punished by suffering from beri-beri. For we must remember that the vitamin was placed there for the good of the plant and not for us. When the germ begins to shoot it starts to live on the grain and its vitamin enables it to oxidise that grain so that the germ can make use of that ample store of food. We use the vitamin in precisely the same way as the growing shoot.

Chemical Reactions in the Body

"It has always seemed curious to me that the most materialistic phase of medicine was the one when most scepticism existed as to the efficacy of drugs, for drugs are eminently material. It was the discovery of hormones

**Pharm. J.* February 17th and 24th, 1940.

and vitamins which revived the belief implied every time a bottle of medicine is prescribed that the body can be influenced by chemical means.

"We may classify the principal ways in which drugs act thus:—

(1) They increase or diminish the effects of stimuli reaching the cell from without.
(2) They modify the chemical changes occurring within the cell itself.
(3) They may themselves be so altered in chemical constitution by the cell as to be capable of fresh activity, yet with diminished toxicity.

"I will try to illustrate each of these methods by examples, and it may be observed that some of the best illustrations of the first group can be obtained from hormones, of the second from vitamins, and of the third from chemotherapy.

"We little realised at the beginning of this century that a new era in pharmacology had dawned when Langley showed that the effect of adrenaline on any part is the same as if the sympathetic nerve to it had been stimulated; it merely seemed an extraordinarily interesting example of a chemical substance imitating a nervous stimulus. But it was much more important than that. Although adrenaline has no effect on a structure which has never received a sympathetic innervation, Elliott found that cutting off that innervation does not abolish the effect of adrenaline on a structure which has once possessed it. On the contrary, its effect is actually increased. For this reason both Langley and Elliott independently put forward the theory of a receptive substance beyond the nerve ending, on which the drug acted.

The Role of Acetylcholine

"In 1907 W. E. Dixon showed that, after stimulating the vagus nerve to the heart a muscarine-like substance could be extracted from the heart muscle which was inhibitory in its action on other heart muscle, and could be antagonised by atropine, just as atropine antagonises vagus stimulation. This accords with the well-known effect of atropine in checking other secretions. Unfortunately, this work of Dixon's met with so much scepticism that he dropped the subject. It was subsequently revived and greatly extended by Dale, and in 1921 by Loewi. The substance produced was proved to be acetylcholine, which was liberated not only when the vagus to the heart was stimulated, but whenever any parasympathetic fibres came into action. There seems to be an inert precursor of acetylcholine present in the receptive substance which, on the arrival of the nervous impulse, is activated by some oxygen set free from glucose by tissue respiration, and then this having done its work of, say, making a muscle contract or a gland secrete, is as promptly destroyed in its turn by a ferment—a special esterase.

"Now, it is known that physostigmine—or eserine, as it is often called in clinical work—imitates the effect of parasympathetic stimulation. Thus, either stimulating the third cranial nerve or instilling eserine will contract the pupil. Loewi has shown that this is because eserine prevents the esterase from destroying the acetylcholine produced. Apparently, then, atropine and eserine act respectively by interfering with and expediting the normal chemical results of parasympathetic stimulation. It is important to note that if atropine be given and the vagus subsequently stimulated, just as much acetylcholine is produced as before, but the atropine prevents it from getting into the receptive substance. In the same way sympathetic stimulation has been found to produce adrenaline at the nerve endings. This is in addition to the adrenaline always stored up in the medulla of the adrenal gland, which can be drawn upon as an emergency ration when there is a sudden demand for widespread action of the sympathetic for purposes of defence.

"We can, therefore, divide the nerve endings of the involuntary nervous system into cholinergic and adrenergic, according as they liberate acetylcholine or adrenaline. Thus it appears to be a general rule that nervous stimuli may liberate chemical substances which transform a nervous stimulus into a chemical reaction, or, in Hopkins' illuminating phrase, that 'substances produced temporarily and locally, by virtue of their chemical properties, translate for the tissues the messages of nerves.'

"Now, just as the appropriate chemical material may get into this receptive substance so may a toxin. G. N. Myers has shown that a therapeutic drug may seize on the receptive substance, and thus bar the way to the ingress of the toxin. He found, for instance, that the diphtheria toxin could be prevented from attacking the heart if digitalis were given first. This resolves a clinical and pharmacological conflict. The pharmacologist has maintained that digitalis cannot exert its usual effect on the toxic heart, but the clinician still continues to administer it, and claims good results. Now we see that, though digitalis would have to be given prophylactically to produce its full effect, if it is got in early it can still bar the way to the toxin swamping the heart. It seems to me that the pharmacology of the future will have to concern itself with the natural history of these receptive substances, and find out in what way they can be helped by drugs both positively, by facilitating their reactions, and negatively, by blocking the way against the entrance of toxins.

"Naturally a good many attempts have been made to use acetylcholine therapeutically where increased action of the vagus or other parasympathetic nerve is required. It must be admitted that the results have been disappointing. When it is given intravenously the effects are too brief, when given by intramuscular or subcutaneous injection too uncertain. The acetylcholine is destroyed too quickly by the esterase. You can see how necessary it is for the activity of the acetylcholine normally to be so brief. Otherwise the effect on a tissue cell would last longer than the brain commanded. But knowing, as we do now, what kind of actions it can produce, the way is pointed out to possible therapeutic uses if more stable substances with the same or similar actions should be available.

"Two such attempts have been made. One is called Doryl, and is the urethane of choline; compared with acetylcholine it has more effect on the gastro-intestinal tract and bladder, and less on the cardiovascular system. It has, therefore, been found useful in post-operative atony. It can be given by intramuscular or subcutanequs injection, by instillation on to the surface of the eye in glaucoma, or even by ionisation through the skin. Given by the mouth its action is uncertain, and it may cause some discomfort and headache. The other is a methyl compound of acetylcholine called Mecholin, which acts on the cardiovascular system and less on the gastro-intestinal tract; just the opposite of Doryl. It has been useful in paroxysmal tachycardia, while ionising it through the skin has relieved the pain of various conditions associated with constriction of the arteries or with phlebitis. This may not be considered a very large harvest for so much toil, but it illustrates a point of great interest, namely that drugs can be prepared synthetically which will have the same effect as a substance prepared by the body for its own use. In the same way ephedrine imitates many of the actions of adrenaline, while of three synthetic substitutes, Veritol imitates the effect of adrenaline on blood pressure, Isalon that on the bronchial muscles and Benzedrine has an additional stimulating effect on the central nervous system. So it would appear that the organic chemist can subtract from or add to the pharmacological action of the native substance.

Prostigmin and Physostigmine

"More striking success has been obtained from a synthetic drug Prostigmin, which like physostigmine, the natural product of the calabar bean, prevents the destruction of acetylcholine at the end plate but does so for a longer period. There is a form of profound muscular weakness, myasthenia gravis. It is often associated with a tumour in the thymus gland and has been induced in dogs by transplants of thymus tissue or by injections of

thymus extract. This is curious, for we do not know that the thymus forms any internal secretion or much about it beyond the fact that it is a more prominent structure in children than in adults. This muscular weakness resembles that seen in poisoning by curare, when, as is well known, the junction between muscle and nerve is blocked at the end plate. Physostigmine can remove that block, so in 1934 it occurred to Dr. Mary Walker to see if it would help a patient with myasthenia gravis. The effect was striking and dramatic. Then in the next year she tried the synthetic Prostigmin and found it still more efficacious without any of the toxic drawbacks of the natural product. It will also completely relieve the artificial myasthenia induced by thymus extracts. Now thymus tissue is lymphatic, and in myasthenia there are little collections of lymphatic tissue to be found in the muscles. It would appear that in some circumstances lymphatic tissue forms a curare-like poison which can be overcome by Prostigmin, thus allowing acetylcholine once more to enter the end plate and restore the power of the muscle to contract. In view of the tendency to use quinine rather indiscriminately as a tonic it is important to observe that it increases the block at the end plate in this particular form of muscular weakness.

"So here we have a fairly complete series of observations showing how the normal transmission of the nervous stimulus is affected, and some of the ways in which it may be interfered with or assisted by certain drugs. The action of strychnine presents some interesting considerations in this connection. Normally a sensory impulse is reflected back through a particular motor channel, *i.e.*, reflex action. It finds its way through one particular path in the abundant nervous network, because the other paths offer greater resistance to its passage. Now strychnine lowers the resistance to the passage of a nervous impulse—hence its use as a stimulant or tonic. But if given in larger doses this resistance is reduced so much that even the slightest sensory impulse finds all the pathways equally open and all the muscles are thrown into action. In normal muscular action the contraction of one group naturally has to be accompanied by a relaxation of its opposing group; but under the influence of strychnine this relaxation is converted into contraction also, so that the whole body is thrown into rigid contraction, in which the strongest group of muscles wins. Very much the same happens in tetanus infection. So here we have an example of a drug doing something which might be considered helpful, namely, facilitating the passage of nervous impulses, but which may have a disastrous effect by throwing open all the pathways for it at once.

"The barbiturates offer a good example of the way in which a drug may bar the entrance of stimuli into the cell by being adsorbed on to the cell envelope. I have been interested for some years to find that general practitioners had come to use phenobarbitone extensively but merely empirically in the treatment of hyperthyroidism. This purely clinical observation received a rational explanation later on when Zondek showed that barbiturates interfered with the entrance of thyroxine into the cell by forming this protective envelope. I think these examples will serve to illustrate ways in which drugs act by increasing or diminishing the effects of stimuli reaching the cell from without."

(*To be continued.*)

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STRAW FOR FODDER

How it may be Used to Economise in Hay

The straw of some crops is by no means negligible in feeding value, although this varies with variety, soil, climate, the stage at which it is cut and the care with which it is harvested. By using it to supply bulk, particularly in maintenance rations, great economies in hay can be effected.

A new Ministry of Agriculture Leaflet, "Growmore No. 43," deals, as follows, with ten different kinds of straw from this point of view and gives examples of rations in which it forms a part. Reference is made to various methods by which straw can be made more palatable, and the feeding value of chaff and cavings is briefly reviewed.

Oat straw is the most nutritious and palatable and should never be used for litter. Many farmers think good oat straw, cut rather immature, is better than poor hay. Grass farmers who have ploughed up and are worried about shortage of hay will find 1 lb. of oat straw mixed with 2 lb. of marrow-stem kale as good as 1 lb. of average meadow hay. It should not be chaffed too short. It may be fed to fattening cattle, sheep and dairy cows, but, if chaffed, only sparingly to horses.

Barley straw is inferior to oat straw but of higher feeding value than wheat straw. In some districts it is used extensively for fattening cattle. Cut into chaff for mixing with roots, well harvested barley straw, especially when it contains some clover, is better than a poor sample of oat straw.

Wheat straw has the lowest feeding value and is the least palatable of the straws. It is best used for bedding unless there is a real scarcity of coarse fodder and the straw contains much bottom herbage. Chaffing it and mixing it with more palatable food is not to be recommended, except in extreme necessity. In such circumstances, feeding it long is preferable.

Rye straw is not suitable for feeding.

Peas, Beans and Vetches

Haulms of peas, beans and vetches are superior in composition to the cereal straws, and if there is plenty of leaf and pod they are richer in flesh-forming qualities. But they are less digestible than oat straw. These haulms give better results when fed as only part of the roughage along with good hay or silage.

Bean straw is best when cut early and carried in good condition. When the straw has become black it is rather indigestible, but even in this condition the pods, leaves and tips are much richer in flesh-forming material than the cereal straws. Good bean straw can be fed to dairy cows, fattening cattle and sheep, but it is not suitable for horses. It should not form more than one-third of the coarse fodder and its binding tendency should be kept in mind.

Pea straw from crops harvested not too ripe and in good condition is one of the best of all straws, little inferior to meadow hay. It varies widely in quality, but when good can be fed to all kinds of livestock.

Vetch straw from crops threshed for seed is coarse and indigestible with feeding value little above that of wheat straw. But a clean, well harvested sample may be used for fodder when other roughages are scarce. Much the same applies to *Clover* straw which is occasionally available.

Buckwheat straw is liable to cause digestive disturbances and should be used only in limited amounts. *Linseed* straw is very fibrous and low in feeding value, but samples containing part of the seed may be relished by horses.

Chaff and Cavings

Chaff may contain much dust and rubbish which should be sifted out before using. When weed seeds and spores are present the chaff would be safer for fodder after scalding or steaming.

Oat chaff is of higher feeding value than oat straw itself. Before feeding, it should be moistened with molasses mixed with hot water and sprayed on with a watering can. This makes it more palatable and prevents the oat flits getting into the eyes of the animals. Another method is to mix it with pulped roots and well-soaked sugar-beet pulp, or cut green stuff. Oat chaff and chaffed kale may be mixed in equal parts to replace hay, at the rate of 2 lb. of the mixture for every 1 lb. of hay. The same remarks apply to *oat clippings*.

Barley chaff is unpopular with many farmers because of its awns, but in the chief barley-growing districts the chaff is almost invariably fed to cattle, damped and mixed with other chaffing, with no great inconvenience to stock.

Wheat chaff has a low feeding value, but can be fed to stock in the same way as oat chaff in an emergency. Awned varieties should not be used.

Linseed chaff, consisting of the leaves and broken pods, with a small proportion of unripe seeds, is a very useful food. Among other things, it contains a small percentage of oil. It may be boiled with water to make linseed jelly or fed to stock in the same way as other chaff. It is unsuitable for very young stock, especially lambs.

Cavings of oats, barley or wheat have a higher feeding value than their straws and should be mixed with pulped roots and fed like chaff.

Clover cob or chaff is another by-product of threshing often wasted. It is comparatively rich in flesh-forming material, and, after damping, is useful for feeding to sheep outside. *Trefoil cob* also makes a useful bulky feed for either sheep or cattle.

Making Straw More Palatable

Straw can be made more palatable in several ways. It is done most commonly by chaffing and mixing the straw with pulped roots. The mixture should be left to stand at least twelve hours before feeding it. This softens the straw. Softening can also be effected by mixing the chaffed straw with silage, wet brewers' grains, or soaked, molassed beet pulp. As the season advances and the straw and the roots get drier, the chaff may be moistened with treacle mixed with warm water and sprayed on with a watering can.

When horses are getting all their bulky food in the form of straw, it is a good practice to add about 7 lb. of linseed cake per horse per week. The cake is mashed in a tub of water; when it is thoroughly softened, the liquid is used to moisten the chaff.

Another method is to sprinkle the chaff with salt at the rate of 1 bushel per ton and to sandwich thin layers of greenstuff amongst the chaff when it is put in the chaff house. Late cuttings of seeds, or almost any late greenstuff, or pulped roots at the rate of 1 cwt. per ton of chaff, will answer the purpose. The mixture is well trodden down and a slow fermentation results.

Still another method is to sprinkle 1 quart of linseed oil mixed with 1 gallon of boiling water over 4 bushels of chaff. It is left to stand overnight and can then be fed with good results to horses, cattle and sheep. Sometimes malt, at the rate of ½ peck per head per week, is fed to horses along with chaff. If malt is not available, malt culms that have been steeped in boiling water are used.

Straw cut into chaff as it leaves the threshing machine should be well trodden and left to lie at least six weeks before use.

Examples of Straw in the Rations

For Dairy Cows of moderate yield, the following maintenance rations would be suitable to cows weighing from 10 to 11 cwt.

(1)

14 lb. good oat straw.
35 lb. oat and vetch silage.

(2)

21 lb. oat straw.
2 lb. dried sugar-beet pulp.
10 lb. wet brewers' grains.

(3)

8 lb. medium meadow hay.
8 lb. barley straw.
18 lb. oat and vetch silage.

(4)

7 lb. medium meadow hay.
8 lb. pea straw.
40 lb. mangolds.

For Fattening Cattle.—In some districts, large numbers of beasts are fattened on rations consisting mainly of straw, sugar-beet pulp or roots helped out with beans or oil cake. The following rations, which have been tested under conditions of Norfolk practice, illustrate the economy in respect of hay that becomes possible:—

(i) *On Farms on the better types of soil*: 100 lb. swedes, 4 lb. seeds hay, 7 lb. barley straw, 3 lb. rolled barley and 1 lb. decorticated cottonseed meal per head per day, with 1 lb. of rolled barley and 1 lb. rolled wheat added at monthly intervals. Oat straw might replace barley straw, wholly or partially, and decorticated groundnut cake might be used instead of cottonseed meal.

(ii) *On Heavy-land Farms making silage and growing a small area of sugar-beet*:—

	1st month	2nd and 3rd months	4th and 5th months
	lb.	lb.	lb.
Oats and vetch silage	40	40	40
Dried sugar-beet pulp	7	7	10
Rolled wheat	—	2	3
Bean meal	3	2	2
Barley straw	ad lib.	ad lib.	ad lib.

* * * * *

Recently a railway depot was badly damaged but the 54 horses were brought through an avenue of fire without a scratch. In another case 84 horses were taken to safety by A.R.P. workers through a bad fire. Though London areas with a heavy horse population have been badly bombed, the total number of casualties among horses has fortunately been surprisingly small and in the whole of England the total does not exceed 500. Great praise is due to those in charge of stables who have rescued horses, in some cases through fire and despite heavy bombing. The Association has asked the A.R.P. Animals Committee to bring any noteworthy incidents before them, so that awards may be made under the Association's scheme of presenting Gold and Silver Medals or Merit Certificates when bravery has been displayed in saving or attempting to save the life of horses or ponies.—*National Horse Association News Sheet.*

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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LACTATION TETANY

To the Editor of the Veterinary Record

Sir,—I have read with interest the discussion on the above subject as reported in the supplementary issue of the *Veterinary Record* of December 21st, 1940. In quite a number of cases there is a great similarity in symptoms between cases of hypomagnesaemia and acetonaemia—so much so that differential diagnosis could only be established by testing the urine for ketone bodies. May I suggest the possibility that some of the cases referred to were actually acetonaemia and that if the appropriate treatment had been given more recoveries would have been recorded.

Yours faithfully,
J. M. Fletcher.

Duisdale,
Lorne Terrace,
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Argyll.

December 29th, 1940.